Aviation Post Mortem: Models Poor Fog Forecast for October 4, 2008

Model guidance from October 3 indicated the LIFR visibility conditions would occur at some TAF sites the morning of October 4. However, no fog occurred. This review will look at what a forecaster could look at to give clues that the models were incorrect.

Synoptic

A cold front extended west to east across the forecast area throughout the day (Figure 1). Aloft, much of the eastern half of the USA was under the influence of an upper trough (Figure 2). The front was forecast to move slowly south through the third and into the fourth of October. The forecast area would remain under the upper trough. No precipitation was forecast.

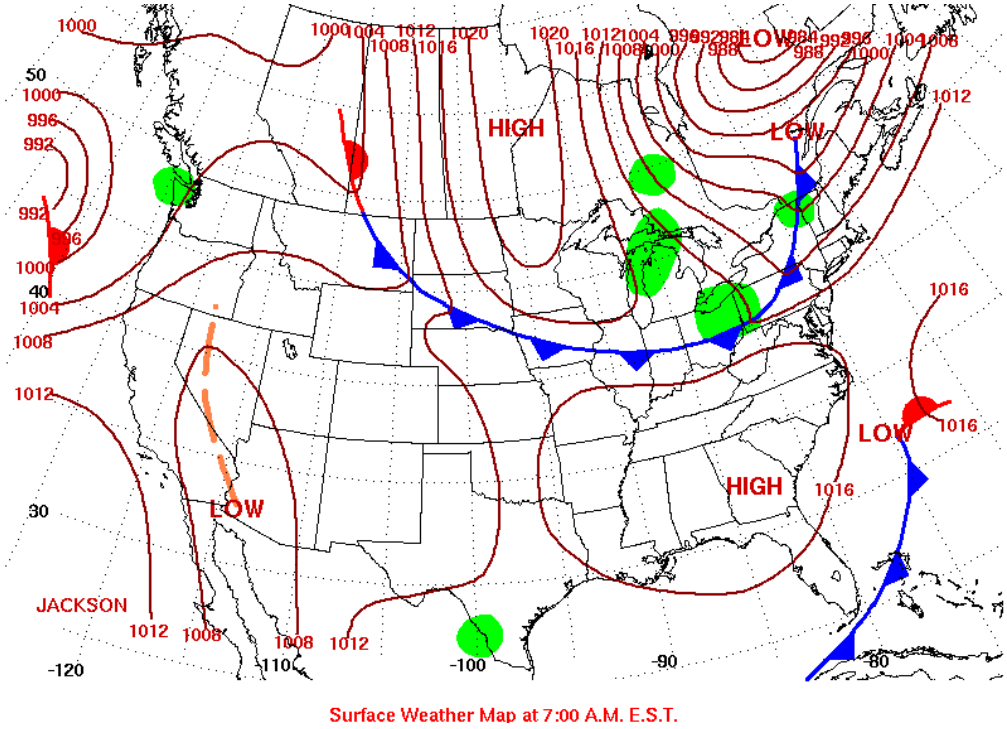

Figure 1 - Surface Fronts 12Z 3 Oct 08

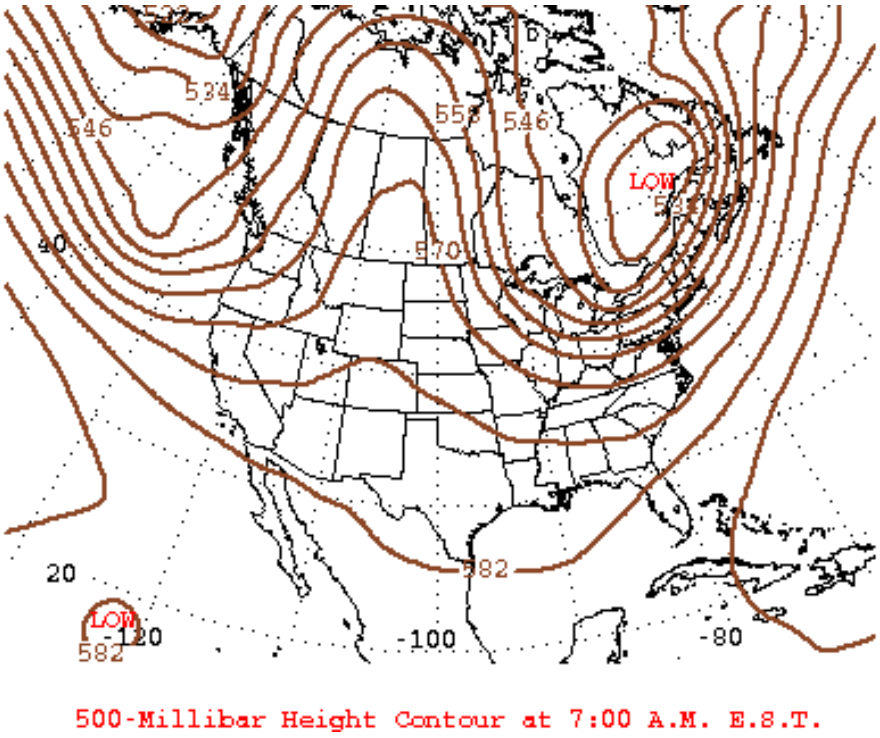

Figure 2 - 500mb Height for 12Z 3 Oct 08

Model Forecasts

MOS

The 06Z 3 Oct GFS MOS (MAV) showed IFR or lower fog occurring at all TAF sites by 12Z 4 Oct with the exception of IND, where MVFR fog was forecast. Figure 3 shows the 06Z MAV for Bloomington (BMG). This is due to the MOS forecast of clear skies and light to calm winds at those locations.

FOUS23 KWNO 030600

MAVNC1

KBMG GFS MOS GUIDANCE 10/03/2008 0600 UTC

DT	/OCT	3			/OCT	4			/OCT	5			/OCT	6			/OCT	7		
HR	12	15	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	00	06
X/N					72				41				77				48			82	
TMP	45	61	69	70	55	49	46	43	43	65	74	75	62	55	51	50	50	69	79	69	63
DPT	40	46	47	46	48	45	44	42	42	50	50	48	51	47	45	46	47	54	56	59	56
CLD	FW	CL	FW	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	FW	FW	CL	CL
WDR	24	24	26	28	00	00	00	00	07	11	17	17	10	08	11	13	13	14	16	15	17
WSP	01	05	06	06	00	00	00	00	01	04	04	03	01	02	03	02	03	07	08	03	04
P06			2		0		0		4		5		1		0		5		8	9	11
P12					2				5				5				7			9	
Q06			0		0		0		0		0		0		0		0		0	0	0
Q12					0				0				0				0			0	
T06		1/	0	0/	0	0/	7	0/	0	1/	0	0/	0	1/	9	1/	0	1/	0	1/	9
T12						0/	7			3/	0			1/	9			3/	0	3/	9
POZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TYP	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
SNW									0								0				
CIG	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
VIS	7	7	7	7	7	7	7	**1**	**1**	7	7	7	7	7	7	7	7	7	7	7	7
OBV	N	N	N	N	N	N	N	**FG**	**FG**	N	N	N	N	N	N	N	N	N	N	N	N

The 00Z 3 Oct ETA MOS (MET) showed MVFR fog occurring at most sites by 12Z 4 Oct, with the exception of LAF, where IFR fog was forecast.

The 12Z 3 Oct MAV guidance did not forecast IFR conditions, but forecast MVFR or better. This is true even though it also showed clear skies and light to calm winds. The 12Z MAV's low temperature forecast was a little warmer than its 06Z run, which may account for this change in forecast.

The 12Z MET guidance showed MVFR conditions for most sites, with no IFR expected.

The MET was forecasting more clouds and warmer minimum temperatures than the MAV for the most part.

Bufkit

The 12Z 3 Oct NAM Bufkit data showed dense fog forming by 12Z 4 Oct at most TAF sites. This can be seen in the fog pane of the Bufkit window. The dense fog is forecast because the temperature falls well below the crossover temperature given by the model. Figure 4 shows the Terre Haute (HUF) forecast for 12Z 4 Oct.

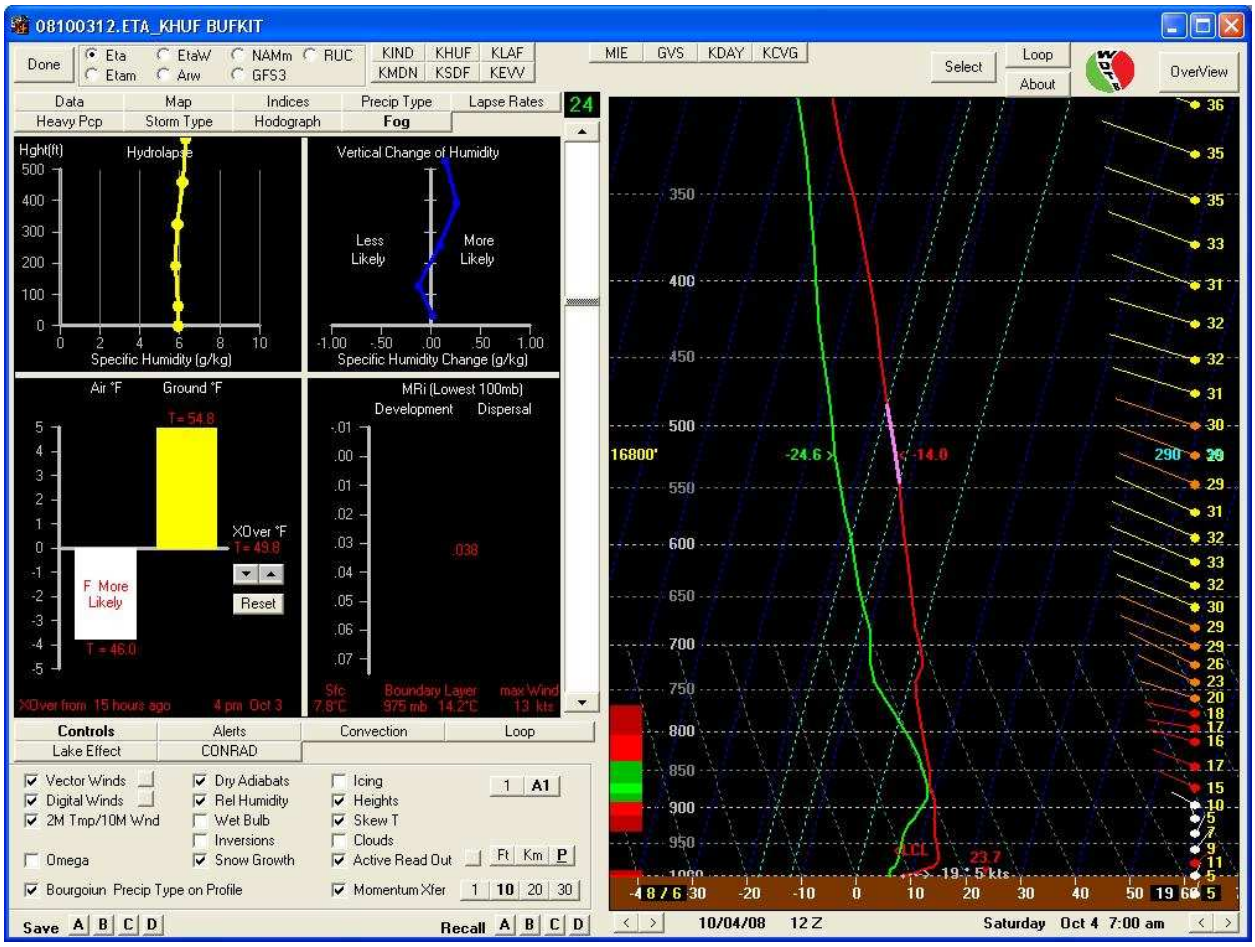

Figure 4 - NAM Bufkit Forecast for HUF 12Z 4 Oct

Model time-height cross sections of relative humidity (not shown) indicated that a layer of greater than 70% relative humidity would be found below 700 mb through out the night, indicating a moist low level environment.

Forecast

Given all of the data presented previously, the forecaster put MVFR fog conditions in the TAF near 12Z 4 Oct for all sites but IND. Confidence was not high enough to go IFR, especially since not all guidance indicated IFR conditions.

What Happened

No fog occurred at any TAF site as visibilities remained P6SM.

Discussion

Clouds stayed around longer than forecast by the MOS, especially the MAV MOS. Figure 5 shows an IR satellite picture for 05Z 4 Oct. Much of Central Indiana is still covered by a cloud deck in the BKN060-090 range. These clouds did not allow the excellent radiational cooling forecast by the MOS.

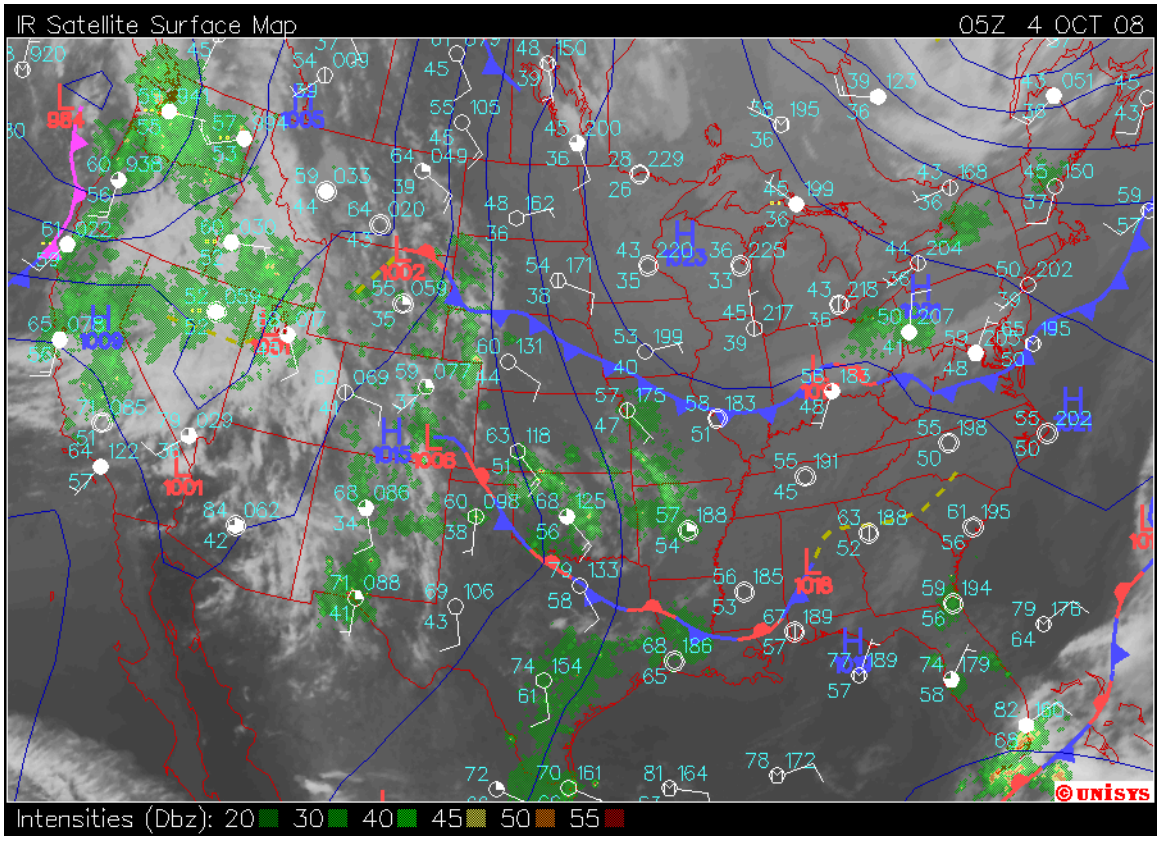

Figure 4 - Satellite/Surface Composite for 05Z 4 Oct

Also, dry air advection at the surface was stronger than predicted by the models. Figure 5 shows the surface dewpoint at 12Z 4 Oct. Note that much of the northern half of Central Indiana has dewpoints below 40 degrees.

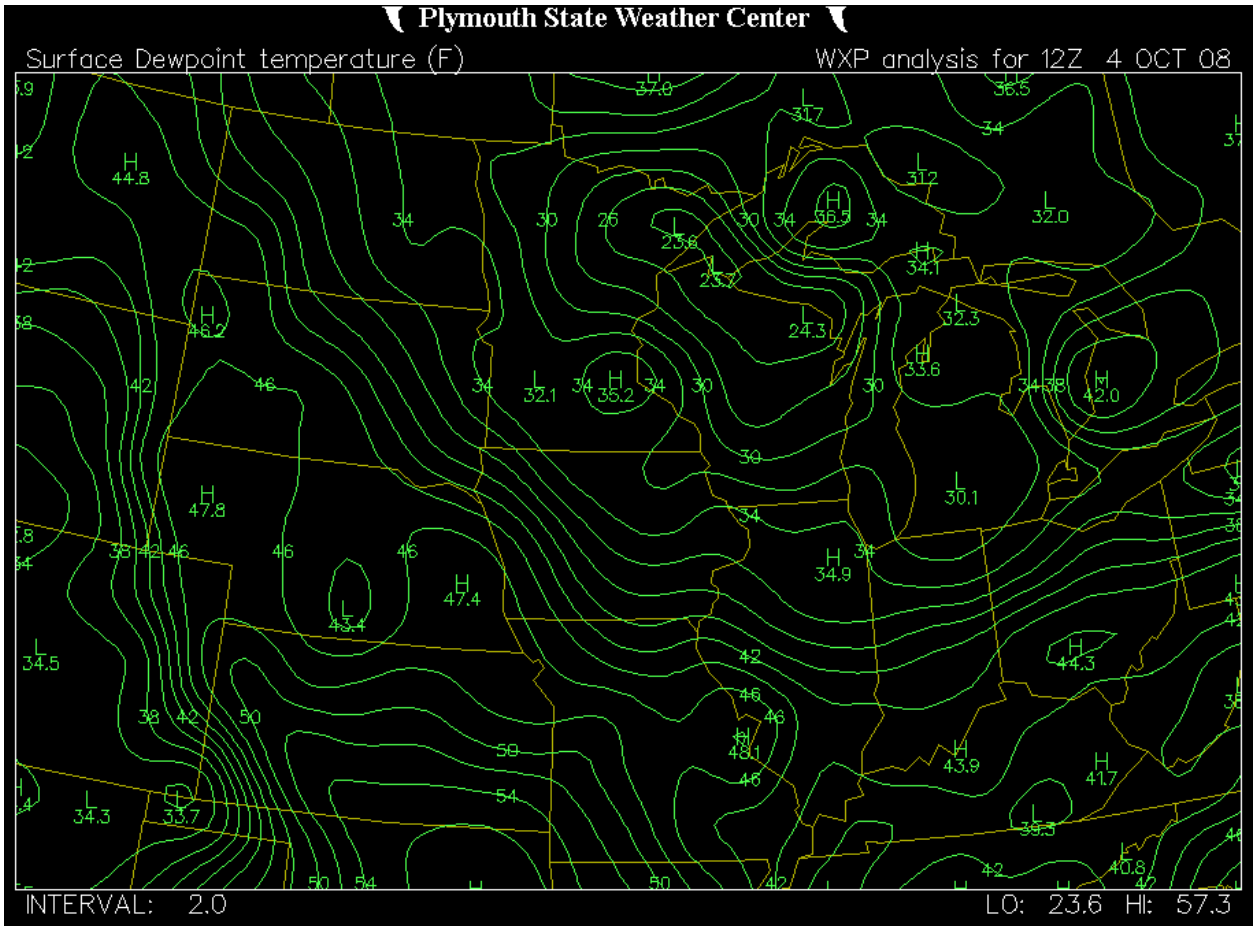

Figure 5 - Surface Dewpoint (F) Contours for 12Z 4 Oct

What clues did the forecaster have that would indicate fog may not occur or be as intense as MOS/Bufkit indicated? First, the trend from the 06Z to 12Z guidance was an improvement in forecast visibilities. None of the 12Z guidance indicated the IFR conditions that the 06Z guidance showed.

Second, for the Bufkit data, note the crossover temperature used will not represent the atmosphere by 12Z. In other words, the fog scheme used by Bufkit does not take into account possible dry advection. (The crossover is editable in Bufkit. The forecaster could change it if he believes it is not representative). However, the Bufkit fog window does offer an indicator that fog would become less likely. The hydrolapse window shows a decrease with height in the lower levels. This favors the formation of dew.

Finally, the sounding data shows relatively strong winds not far above the surface. This mixing may also have been enough to help keep fog from forming (see the June 2007 aviation post-mortem by this author).

Thus a forecaster should be cautious when MOS is showing IFR/LIFR conditions, especially if MOS is not consistent in showing them. Be sure to look for clues in other data that may indicate better conditions.